Claims:

1. A reflective liquid crystal display device, comprising:

a liquid crystal layer sandwiched between a first substrate having a light reflexibility and a second substrate having a light transmissibility, the liquid crystal layer being composed of twist-aligned nematic liquid crystal having a positive dielectric anisotropy; and

circularly polarizing means, including a single linear polarizer plate, for selectively passing either right handed or left handed circularly polarized light out of natural light,

the reflective liquid crystal display device being characterized in that

the first substrate, the liquid crystal layer, and the circularly polarizing means are stacked in this order to form at least a part of the reflective liquid crystal display device,

the circularly polarizing means is disposed so that a major surface of the circularly polarizing means is on a liquid crystal layer side, the circularly polarized light exiting the circularly polarizing means through the major surface when natural light enters the circularly

polarizing means,

the liquid crystal in the liquid crystal layer has a birefringence difference, which, if multiplied by a thickness of the liquid crystal layer, produces a product of not less than 150nm and not more than 350nm, and

the liquid crystal layer has a twist angle in a range of 45° to 100°.

2. The reflective liquid crystal display device as set forth in claim 1, being characterized in that

the circularly polarizing means includes: a first optical retardation compensator plate having a retardation in a substrate normal direction set to not less than 100nm and not more than 180nm; a second optical retardation compensator plate having a retardation in a substrate normal direction set to not less than 200nm and not more than 360nm; and a linear polarizer plate, the first optical retardation compensator plate, the second optical retardation compensator plate, and the linear polarizer plate being stacked in this order when viewed from the liquid crystal layer, and

$|2\times\theta 2 - \theta 1|$ has a value not less than 35° and not more than 55°, where $\theta 1$ represents an angle formed by a slow axis of the first optical retardation compensator plate and either a transmission axis or an absorption

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axis of the linear polarizer plate, and $\theta 2$ represents an angle formed by a slow axis of the second optical retardation compensator plate and either the transmission axis or the absorption axis of the linear polarizer plate.

3. The reflective liquid crystal display device as set forth in claim 2, being characterized in that

the twist angle of the liquid crystal layer is in a range from 60° to 100°,

the product of the birefringence difference of the liquid crystal in the liquid crystal layer and the thickness of the liquid crystal layer is not less than 250nm and not more than 330nm, and

either the transmission axis or the absorption axis of the linear polarizer plate forms an angle, $\theta 3$, of not less than 20° and not more than 70°, or not less than 110° and not more than 150° with an alignment direction of the liquid crystal molecules in a close proximity of the second substrate.

4. The reflective liquid crystal display device as set forth in ~~any one of~~ claim~~s~~ 1 ~~through 3~~, being characterized in that

the first substrate having a light reflexibility

includes a light reflective film, and

the light reflective film has smooth and continuously changing concavities and convexities, and is made of a conductive material.

5. The reflective liquid crystal display device as set forth in claim 4, being characterized in that

the smooth and continuously changing concavities and convexities of the light reflective film have a direction dependent property that varies according to a direction on a substrate plane.

6. The reflective liquid crystal display device as set forth in ~~any one of~~ claims 1 ~~through 3~~, being characterized in that

a single third optical retardation compensator plate or a plurality of the same is(are) provided between the circularly polarizing means and the liquid crystal layer to cancel a residual phase difference of the liquid crystal layer.

7. The reflective liquid crystal display device as set forth in claim 6, being characterized in that

either the third optical retardation compensator plate or at least one of the third optical retardation

compensator plates has an inclined optical axis, or a three-dimensionally aligned optical axis having therein a continuously varying inclined direction.

8. The reflective liquid crystal display device as set forth in claim 1 ~~any one of claims 2 and 3~~, being characterized in that

the first and second optical retardation compensator plates have such ratios of a refractive index anisotropy, $\Delta n(450)$, with respect to light having a wavelength of 450nm, a refractive index anisotropy, $\Delta n(650)$, with respect to light having a wavelength of 650nm, and a refractive index anisotropy, $\Delta n(550)$, with respect to light having a wavelength of 550nm that satisfy

$1 \leq \Delta n(450)/\Delta n(550) \leq 1.06$ and

$0.95 \leq \Delta n(650)/\Delta n(550) \leq 1$ respectively.

9. The reflective liquid crystal display device as set forth in claim 8, being characterized in that

the first and second optical retardation compensator plates have such ratios of a refractive index anisotropy, $\Delta n(450)$, with respect to light having a wavelength of 450nm, a refractive index anisotropy, $\Delta n(650)$, with respect to light having a wavelength of 650nm, and a refractive index anisotropy, $\Delta n(550)$, with respect to light having a wavelength of 550nm, with respect to

light having a wavelength of 550nm that satisfy

$1 \leq \Delta n(450)/\Delta n(550) \leq 1.007$ and

$0.987 \leq \Delta n(650)/\Delta n(550) \leq 1$ respectively.

10. The reflective liquid crystal display device as set forth in ~~any one of~~ claim~~s~~ 1 ~~through 3~~, being characterized in that

the twist angle of the liquid crystal layer is in a range of not less than 65° and not more than 90°,

the product of the birefringence difference of the liquid crystal in the liquid crystal layer and the thickness of the liquid crystal layer is not less than 250nm and not more than 300nm, and

either a transmission axis or an absorption axis of the linear polarizer plate forms an angle, $\theta 3$, of not less than 110° and not more than 150° with an alignment direction of the liquid crystal molecules in a close proximity of the second substrate.

11. The reflective liquid crystal display device as set forth in ~~any one of~~ claim~~s~~ 1 ~~through 3~~, being characterized in that

either a transmission axis or an absorption axis of the linear polarizer plate forms an angle, $\theta 3$, of not less than 110° and not more than 150° with an alignment

direction of the liquid crystal molecules in a close proximity of the second substrate, and

a viewing direction is set to a direction on a plane that is defined by a normal to a display surface and a direction 90° off the alignment direction of the liquid crystal molecules in a close proximity of the second substrate.

12. The reflective liquid crystal display device as set forth in ~~any one of~~ claim~~s~~ 1 ~~through 3~~, being characterized in that

either a transmission axis or an absorption axis of the linear polarizer plate forms an angle, $\theta 3$, of not less than 20° and not more than 70° with an alignment direction of the liquid crystal molecules in a close proximity of the second substrate, and

a viewing direction is set to a direction on a plane that is defined by a normal to a display surface and the alignment direction of the liquid crystal molecules in a close proximity of the second substrate.

13. The reflective liquid crystal display device as set forth in claim 5, being characterized in that

either a transmission axis or an absorption axis of the linear polarizer plate forms an angle, $\theta 3$, of not

less than 110° and not more than 150° with an alignment direction of the liquid crystal molecules in a close proximity of the second substrate,

a viewing direction is set to a direction on a plane that is defined by a normal to a display surface and a direction 90° off the alignment direction of the liquid crystal molecules in a close proximity of the second substrate, and

the viewing direction is set to be on a plane that is defined by the normal to the display surface and a direction on a substrate plane in which the concavities and convexities of the light reflective film have a shorter mean cycle than in other directions.

14. The reflective liquid crystal display device as set forth in claim 5, being characterized in that

either a transmission axis or an absorption axis of the linear polarizer plate forms an angle, $\theta 3$, of not less than 20° and not more than 70° with an alignment direction of the liquid crystal molecules in a close proximity of the second substrate,

a viewing direction is set to a direction on a plane that is defined by a normal to a display surface and the alignment direction of the liquid crystal molecules in a

close proximity of the second substrate, and

the viewing direction is set to be on a plane that is defined by the normal to the display surface and a direction on a substrate plane in which the concavities and convexities of the light reflective film have a shorter mean cycle than in other directions.

15. The reflective liquid crystal display device as set forth in ~~any one of~~ claim~~s~~ 1 ~~through 3~~, being characterized in that

either a transmission axis or an absorption axis of the linear polarizer plate forms an angle, $\theta 3$, of not less than 40° and not more than 60° with an alignment direction of the liquid crystal molecules in a close proximity of the second substrate, and

the liquid crystal molecules in a close proximity of the second substrate form an angle $\theta 4$ with a direction on a plane that is defined by a viewing direction and a normal to a display surface, the angle $\theta 4$ being set to not less than 0° and not more than 30°, or not less than 180° and not more than 210°.

16. A reflective liquid crystal display device incorporating a touch panel arranged from the reflective liquid crystal display device as set forth in any one of

claims 1 through 3, being characterized in that

a planar pressure sensitive element for detecting an external pressure is sandwiched with a layer-shaped empty space between the circularly polarizing means and the second substrate.

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